R E P O R T R E S U M E S

ED 018 604 VT 001 655

THE WASHINGTON DATA PROCESSING TRAINING STORY.

BY- MCKEE, R.L.
WASHINGTON STATE BOARD FOR VOCAT. EDUC., OLYMPIA

PUB DATE OCT 63

EDRS PRICE MF-$0.25 HC-$1.60 38P.

DESCRIPTORS- *DATA PROCESSING, *PROGRAM PLANNING, PROGRAM COSTS, CURRICULUM, TEACHER QUALIFICATIONS, ADMISSION CRITERIA, LABORATORY EQUIPMENT, *BUSINESS EDUCATION, POST SECONDARY EDUCATION, *TECHNICAL EDUCATION, PROGRAM DESCRIPTIONS, DATA PROCESSING OCCUPATIONS, WASHINGTON,

A DATA PROCESSING TRAINING PROGRAM IN WASHINGTON HAD 10 DATA PROCESSING CENTERS IN OPERATION AND EIGHT MORE IN VARIOUS STAGES OF PLANNING IN 1963. THESE CENTERS WERE FULL-TIME DAY PREPARATORY 2-YEAR POST-HIGH SCHOOL TECHNICIAN TRAINING PROGRAMS, OPERATED AND ADMINISTERED BY THE LOCAL BOARDS OF EDUCATION. EACH SCHOOL HAD A COMPLETE DATA PROCESSING COMPUTER CENTERED LABORATORY VALUED AT MORE THAN $200,000. THE TECHNICAL PORTION OF THE CURRICULUM, DESIGNED TO TEACH THE TECHNOLOGY OF THE INDUSTRY, CONSIST OF COURSES IN BASIC DATA PROCESSING WHICH COVERED PUNCHED CARD MACHINE PROCEDURES, BASIC COMPUTER PROGRAMING CONCEPTS, SYSTEMS DESIGN, AND MACHINE APPLICATIONS. RELATED COURSES INCLUDED ACCOUNTING PRINCIPLES, COMMUNICATION SKILLS, HUMAN RELATIONS, BUSINESS ORGANIZATION, AND MATHEMATICS. THE CURRICULUM IS BASED UPON THE 3-HOUR BLOCK OF TIME APPROACH. LOCAL ADVISORY GROUPS REVIEWED THE CURRICULUM WHEN NEW PROGRAMS OF TRAINING WERE UNDER CONSIDERATION. THE FIRST YEAR OF THE PROGRAM COST APPROXIMATELY $2,000 AND THE SECOND YEAR APPROXIMATELY $1,000 PER FULL-TIME STUDENT. A STATEWIDE DATA PROCESSING CURRICULUM REVIEW COMMITTEE APPROVED THE PROGRAM BUT HAD CONCERNS IN THE MAJOR AREAS OF OBTAINING QUALIFIED INSTRUCTORS, RECRUITING QUALIFIED STUDENTS, AND MAINTAINING HIGH STANDARDS IN THE TRAINING PROGRAM. THE DOCUMENT INCLUDES (1) OBJECTIVES OF THE PROGRAM, (2) DEVELOPMENT OF THE CURRICULUM, (3) OUTLINE OF A 2-YEAR CURRICULUM, (4) REQUIREMENTS AND QUALIFICATIONS OF STUDENTS, (5) QUALIFICATIONS OF THE INSTRUCTOR, (6) SELECTION OF EQUIPMENT WITH ILLUSTRATIONS AND FLOOR PLAN, AND (7) INSTALLATION AND OPERATIONAL COSTS. (PS)

1655

STATE OF WASHINGTON

ED018604

TECHNICAL EDUCATION

1963

WASHINGTON'S DATA PROCESSING TRAINING STORY

VT 01655

STATE BOARD FOR VOCATIONAL EDUCATION

OLYMPIA WASHINGTON

State of Washington
STATE BOARD FOR VOCATIONAL EDUCATION
Olympia

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL OFFICE OF EDUCATION POSITION OR POLICY.

THE WASHINGTON DATA PROCESSING TRAINING STORY

This publication is in response to the many and continual requests for information on the Washington State Data Processing Training Program.

by

R. L. McKee, State Supervisor for
Technical and Industrial Education

FOREWORD

In analyzing job openings of today and the future, the Washington State Board for Vocational Education found what every other vocational program has found, that training and education in data processing represent one of the greatest job opportunities and at the same time one of the most pressing needs of business, industry, and government. Instead of passing by this large and growing field because of technical difficulties in implementing such a program, fifteen schools in the state have boldly attacked this need. To all vocational schools, it has long been obvious that some day the problem must be met. There has been no indication that the starting will be easier tomorrow than today. Washington is already well under way.

In developing a data processing curriculum, a vocational school has two choices. It can duplicate programming courses provided by computer manufacturers, or it can provide the kind of education and training that both manufacturers and their customers alike proclaim is needed. The former course consumes approximately four weeks; the latter approximately two years.

The computer user looks for, but realistically does not expect to find, properly educated and trained programmers. Washington vocational schools are now engaged in a program to bring relief to this long neglected vocational need. Students are being both educated and trained,--educated so that they will know what needs to be done without being told, and trained so that they will always maintain proper standards of performance. Their education is not being limited to the computer, but includes instruction that will give them understanding of the environment in which they and the computer will work. They will know what a payroll is, and what effect all of its component

and related parts have upon the operation of a business. They will learn how to produce such a payroll with its related records on a computer. They will learn other applications so that they will have an understanding of how data are captured in the course of doing business and processed to produce desired results. Their education will be such that, when they are later confronted on the job with an application foreign to their experience, they will feel at home with the problem, and will be capable of meeting it.

Their training will include charting, documentation, proper display techniques and other skills required, and this training will develop habits which will withstand subsequent deadline pressures. All this is the goal of the fifteen vocational schools in the State of Washington that have embarked upon the data processing program. This goal is achievable. It appears very likely that the schools will achieve it.

October 1963

TABLE OF CONTENTS

AREA I. HISTORY DEVELOPMENT AND IMAGE OF STATE WIDE PROGRAM 1

AREA II. PRINCIPLES AND PHILOSOPHY GUIDING DATA PROCESSING 3
Development of the Curriculum and Curriculum Guide and Objectives of the Program

AREA III. THE CURRICULUM 6
Approach, technology, related courses, Outline of 2-year Curriculum

AREA IV. LIST OF DATA PROCESSING SCHOOLS 12
Enrollment, Starting date, etc.

AREA V. GRAPH - NEED FOR DATA PROCESSING TRAINING PROGRAMS 14

AREA VI. THE STUDENT 15
Requirements and Qualifications

AREA VII. THE INSTRUCTOR 16
Need for technical competence, business experience, and professional education

AREA VIII. THE DATA PROCESSING LABORATORIES AND EQUIPMENT 17
Selection of the equipment, illustrations, floor plan

AREA IX. COST OF INITIATING DATA PROCESSING PROGRAM 26
Installation and Operational Costs

AREA X. REVIEW COMMITTEE 30

AREA XI. SUMMARY 33

AREA I. HISTORY DEVELOPMENT AND IMAGE OF STATE-WIDE PROGRAM

In March, 1962, the State of Washington deemed it necessary to launch into a concentrated state-wide development of a Data Processing training program. Now, a year and a half later, Washington has ten data processing centers in operation and eight more in various stages of planning. These centers are full-time day preparatory two-year technician training programs, operated and administrated by the local boards of education.

The four basic training programs offered in Washington technical schools and community colleges are:

1. A two-year technician program which was the basic objective in establishing Data Processing training.
2. A one-year training program for unit record operators which should be phased out in approximately three years.
3. A one to three month key punch training program which will taper off as new Data Processing techniques eliminate much of the need for key punch operators.
4. In addition to the three types of full-time day programs listed above, all centers will be offering a number of orientation courses along with advanced specialized training for employed Data Processing personnel.

The activity which brought about this development may be broken down into two periods of time.

1. The planning stage which consists of approximately six months during which four workshops were held, a brochure was published, a two-year curriculum guide was published and individual program implementation with schools was accomplished.

2. A second period of time consists of the 1962-63 school year, when the two schools, previously operating data processing training, greatly expanded their objectives and capabilities. Three other centers initiated new programs in September 1962. This was followed with five additional centers starting training programs in January 1963. Planning was initiated with five more centers that intend to start their training programs in 1964. General plans were laid for three centers to start programs in 1965. This makes a total of eighteen schools that will be offering data processing training in the state.
Also during this past school year, five additional workshops were held for the new instructors and administrators; the curriculum guide was modified to reflect the changes in data processing industry and the teacher experiences from the first year of operation.

In addition to the state and local school personnel who teamed up to produce Washington's Data Processing training programs, many people from the data processing industry worked on state and local committees to launch these programs to meet Washington's crisis for trained Data Processing personnel. One example, the IBM company assigned a full-time person to work with state and local school personnel on curriculum development and to disseminate detailed course information and techniques.

Last year the present ten centers enrolled 225 day preparatory students, and the twelve evening extension programs enrolled more than 2,000 adults. Each of these ten day schools have a complete Data Processing computer centered laboratory and average better than $200,000 worth of data processing equipment per school.

AREA II. PRINCIPLES AND PHILOSOPHY GUIDING DATA PROCESSING

The Washington State Data Processing training presents a balanced program in this rapidly developing field. Basically, it is designed as a day program--occupation centered--to train individuals for gainful employment and to meet the needs for skilled manpower.

The technical portion of the curriculum is designed to teach the technology of this industry. These courses in basic data processing cover punched card machine procedures, basic computer programming concepts, systems design and machine applications. The major portion of the time is devoted to these laboratory courses.

Related courses are included to give scope and background to the student. These courses in accounting principles, communication skills, human relations, business organization and math provide essential background information for the data processing technician.

The curriculum guide was developed by the Washington State Board for Vocational Education in cooperation with the International Business Machines Corporation. It was prepared to assist in the preparation of post-high school programs--technical institutes and community colleges. The material developed was aided by the U. S. Office of Education Business Data Processing Curriculum Guide and statewide conferences attended by administrators from ten vocational-technical schools and community colleges from the State of Washington.

Local advisory groups review the curriculum when new programs of training are under consideration. Since local requirements vary, factors such as student entrance requirements, instructional staff competencies, local employers needs and coordination with existing programs will influence

the design of the programs. Recognizing the dynamic nature of data processing technology today, the curriculum has sufficient flexibility to allow modifications without disturbing the necessary sequence of instruction.

The purpose of the curriculum guide is to help the staff of each of these schools in developing a balanced program, to set forth basic criteria so that schools may share experiences and materials, and to assure industry of uniformly highly-trained individuals.

Objectives of the Program

The major objective of this two-year program is to prepare a technically qualified data processing technician. Such a person must be knowledgeable in the field of Data Processing technology, including the conditions in which he shall be working--the machine and its operation and any other related equipment. A person should be able to perform the following basic functions associated with a Data Processing center:

1. Assist the Systems Analyst in problem definition, and in the design of a logical systems approach to solving data problems and to provide the required information to all levels of the organization.
2. Develop detailed Data Processing procedures, wire control panels or write programs, and document these procedures in a professional manner.
3. Develop test data and test the procedures and programs.
4. Implement the use of the system.
5. Make modifications and changes as they are required.

Graduates should have a general knowledge of the wide range and variety of equipment but be proficient in the use of one particular machine. They should be capable of learning the programming of any specific machine with a minimum of training, assuring them freedom to perform in any position and

become of greater service to the industry.

In addition to the major objective of preparing a technically qualified Data Processing technician, the program has these additional objectives:

1. At the end of the first year, a student should be qualified as a Unit Record Operator.
2. Additional courses may be offered as exploratory or general education for the student who needs an appreciation of Data Processing as a tool for his occupational or professional objective.

   Examples of such courses might be:

   a. An orientation class offered through the adult evening program to the people that desire a general knowledge of the field of Data Processing.

   b. An introduction to Data Processing for business or industrial managers to aid them in making better use of Data Processing in their daily activities.

   c. Orientation and programming courses for the college student preparing for other vocations or professions which use Data Processing.

   d. An introductory course for high school students.

3. A variety of upgrading courses for persons presently engaged in Data Processing occupations.

AREA III. THE CURRICULUM

In the designing of any technical education curriculum, there are two factors to be considered. One is to provide the training which is essential to employment. The other is to provide the education productive of an informed, responsible and participating citizen. The problem is one of determining a proper balance between them. If each is to be achieved in considerable measure, neither can be realized in its entirety. We feel that a proper balance has been achieved in technician training when the student spends 50% of his time in his technical specialty (Data Processing laboratory), 30% of his time in the basic background subjects (mathematics, accounting, English) and the remaining 20% of his time in general education and electives. These courses are designed specifically to meet the needs of the technician and are not the traditional academic courses. The subject matter is related to Data Processing throughout each of the courses.

The emphasis throughout the curriculum is upon Data Processing technology primarily concerned with the business community, but the curriculum may also prepare the students for the scientific and industrial control areas as well. Some schools have taken the basic approach that there are three occupational objectives in Data Processing: Business Data Processing, Scientific Data Processing, and Industrial Process Control. According to the employment needs of the community, a school will decide which of these objectives more nearly meets their programming needs; then the staff and equipment must be obtained. The Washington curriculum takes a somewhat different approach. Technical training programs should be offered on a broader basis--a core or family approach--dealing with more of the basic principles of the technology. Industry will offer the specialized training peculiar to their type of work. Systems Programming for business, scientific

and process control has a common body of knowledge, and if a programmer is trained with sufficient depth, he will understand the basic principles of programming to a point where he will be able to acquire the knowledge of a particular machine or problem in a short company training course. Specific technical application areas may require mathematics or other technical courses in addition to the core subjects presented in this curriculum.

The Data Processing Curriculum is based upon the three-hour block of time approach, meaning that a student would spend three hours per day in the Data Processing laboratory/classroom and two or three hours on related subjects. The major reasons for this approach are as follows:

1. This allows the technology to be tailored to the student's needs, allowing more individual contact.
2. It allows more flexibility than the one-hour program, because the instructor can move from lecture, to demonstration, to student practice, in varying the time according to the manner best suited to the topic.
3. This approach allows effective use of the laboratory. For example, two groups of students could use one laboratory. One group of students could use the laboratory in the morning and take the related training in the afternoon while another group could reverse this schedule.
4. The technical instructor's time can better be utilized teaching the three-hour data processing class which he knows best. Other specialized instructors of the vocational education staff would teach the specialized math and accounting, etc.
5. It allows more flexibility by rotating students on different machines, giving them time to spread out on different projects in the laboratory.

6. It allows for an ideal amount of student-instructor contact so the technical instructor can work individually with the students in the three-hour block of time while the student will also have the advantage of coming in contact with two or three other related instructors.
7. It allows time for immediate response by actually performing in the laboratory operations and techniques introduced by the instructor in lecture.
8. The State Plan for operating Vocational-Technical Education Programs based upon State and Federal regulations sets forth the minimum of three hours per day on the occupational objective.

The Technology

Instruction in the field of specialization starts in the first quarter with three courses devoted to the principles of operation, capacities and limitations of some of the less complex data processing equipment including control panel wiring, programming of collators, reproducers, accounting machines and calculating punches. Data Processing applications are introduced in the second quarter along with an introduction to programming.

There are four courses in programming computers, a course in systems, and a field study or work experience project in systems. The programming courses deal with the elements of automatic coding, the planning and programming of computer applications in accounting, auditing and data protection and programming electronic digital computers. The courses in systems and procedures for data processing include a study of integrated or total management information systems with emphasis on work simplification and procedure writing. This is reinforced by field work involving feasibility studies in actual business situations.

Related Courses

Included in the curriculum in addition to the courses in Data Processing technology are courses in related areas and subjects. The courses give the student the necessary appreciation and understanding of Data Processing users' problems and desires so that he may use his technical knowledge effectively.

The handling of business records and the control of accounts, inventory, sales, income and expenditures are essential bases for management decisions. To provide an adequate understanding of the principles of accounting, three courses are included in the curriculum (accounting is closely allied with Data Processing techniques during the first year).

Mathematics courses cover basic logic, the number systems, algebra with emphasis on problem solving, computations with logarithms and Boolean algebra.

A course in elementary statistics covering descriptive statistics and statistical inference is included to give background for Data Processing and the elements of business systems analysis.

Exceedingly important as a part of Data Processing training is the development of proficiency in communication skills. It is necessary to communicate data and ideas clearly and effectively. Courses in communication are included in the curriculum in the first year. Such courses give special attention to the development of the ability to write clearly and concisely. Report writing and methods of presentation of data to management should be included. Provision is also made to develop skill in oral communication.

The curriculum outlined underwent intensive review by representatives of business, industry and educators concerned with this field of work. It is the product of the pooled suggestions of a large number of people and represents somewhat the middle ground of the recommendations which were received.

The curriculum guide indicates the scope, or breadth, of the concepts to be introduced and a suggested sequence into which these concepts can be arranged. It contains outlines of the courses to be presented.

The job of preparing course instructional materials, teaching guides and units of instruction, and making the curriculum fit local needs and conditions is that of the instructional staff of the school utilizing the curriculum. In short, the individual laboratory or classroom teacher with competent and expert advice will make the final determination of the actual units of instruction, the time to be spent on each topic, which textbooks and references to use and what supplementary materials will be necessary to develop the best learning situation.

The curriculum can only suggest those areas of information which should be covered to give students a fund of knowledge and a level of competency which will enable them to enter and make progress in business and industry. The instructor must determine the proper application of the concepts outlined in this curriculum. The school should seek the assistance of a local advisory committee consisting of representatives of labor, industry and professional associations, local school supervisors and administrators, and technical consultants, all of whom can help in developing courses of study for the curriculum and in determining local adaptations.

Curriculum Revision

In Data Processing, curriculum change is a situation that everybody will have to accept because of the dynamic nature and constant evolution that the industry is going through. We have revised and will continue each year to revise our state's Data Processing Curriculum Guide. Revision is based on the experience of the instructors in the program and recommendations

from the review committee of industry. There is continuous up-dating of the program in keeping with current and anticipated practices in the industry. This shall continue to be true in the foreseeable future.

DATA PROCESSING
TWO YEAR POST HIGH SCHOOL CURRICULUM

First Year

First Quarter (Fall)

Time	Subject	Clock Hours	Credits	Hrs. per wk. Class Room	Hrs. per wk. DP Lab
8:00 to 11:00	Data Processing Laboratory I Introduction to Data Processing Principles Unit Record Processing Equipment	180 (30) (150)	8		15
11:00	Communication Skills I	36	3	3	
12:00	Lunch				
1:00	Data Processing Mathematics I	36	3	3	
2:00	Principles of Accounting I	36	3	3	

Second Quarter (Winter)

8:00 to 11:00	Data Processing Laboratory II Unit Record Processing Equipment Data Processing Applications I Basic Computer Systems Computer Programming I - Machine Language Programming	180 (40) (40) (40) (60)	8		15
11:00	Communication Skills II	36	3	3	
12:00	Lunch				
1:00	Data Processing Mathematics II	36	3	3	
2:00	Principles of Accounting II	36	3	3	

Third Quarter (Spring)

8:00 to 11:00	Data Processing Laboratory III Computer Programming II - Card System Programming Data Processing Applications II	180 (140) (40)	8		15
11:00	Communication Skills III	36	3	3	
12:00	Lunch				
1:00	Principles of Statistical Analysis I	36	3	3	
2:00	Principles of Accounting III	36	3	3	

Second Year

Fourth Quarter (Fall)

Time	Subject	Clock Hours	Credits	Hrs. per wk. Class Room	Hrs. per wk. DP Lab
9:00	Principles of Statistical Analysis II	36	3	3	
10:00	Social Science (Industrial Psychology)	36	3	3	
11:00	Elective	36	3	3	
12:00	Lunch				
1:00 to 4:00	Data Processing Laboratory IV	180	8		15
	Computer Programming III - Disk Pile System Programming	(140)			
	Systems Development and Design I - Theory and Techniques	(40)	8		

Fifth Quarter (Winter)

9:00	Data Processing Mathematics III	36	3	3	
10:00	Business Organization and Management	24	2	2	
11:00	Social Science II (Supervisory Training)	36	3	3	
12:00	Lunch				
1:00 to 4:00	Data Processing Laboratory V	180	8		15
	Computer Programming IV - Tape System Programming - Introduction to other Systems	(90)			
	Data Processing Applications III	(30)			
	Systems Development and Design II - Case Studies	(60)			

Sixth Quarter (Spring)

9:00	Introduction to Engineering Applications	36	3	3	
10:00	Elective	36	3	3	
11:00	Social Science III (Industrial Economics)	36	3	3	
12:00	Lunch				
1:00 to 4:00	Data Processing Laboratory VI	180	8		15
	Computer Programming V - Programming Systems and Utility Programs	(120)			
	Systems Development and Design III- Field Assignment Practice Problem	(60)			

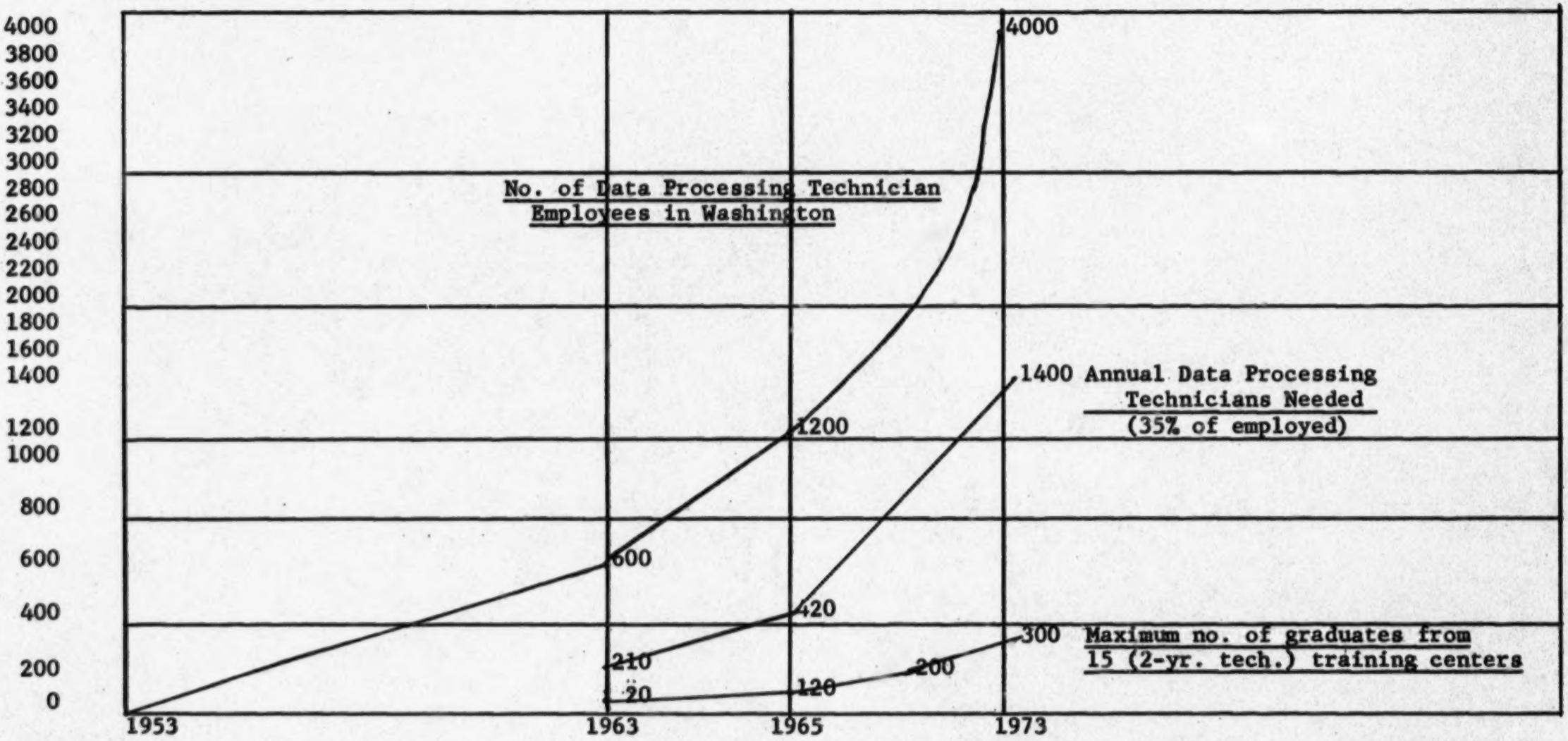
Data Processing Schools
in the State of Washington

August 1963

School	Dates Established and Enrollments in: Full Time Day 2-year Computer Programmer	Full Time Day 1-year Unit-Record Operator	Full Time Day Key-Punch Operator	Evening Extension Programs for Employed Workers
Grays Harbor Community Coll. College Heights Aberdeen, Washington	Plan for 1964			
Auburn Voc.-Tech. School 800 - 4th Street N. E. Auburn, Washington	Tentative plan for 1965			1962 100 students
Bellevue School District 310 102nd Ave., N. E. Box 67 Bellevue, Washington	Presently considering offering a day program			1962 230 students
Bellingham Technical School 3028 Lindbergh Avenue Bellingham, Washington	Presently considering offering a day program			
Olympic Community College 1519 Chester Bremerton, Washington	Jan. 1963 20 students	Part of 2-year Computer Programmer course		1963 110 students
Centralia Community College Locust & Oak Streets P. O. Box 660 Centralia, Washington	Sept. 1962 20 students	Part of 2-year Computer Programmer course		
Everett Junior College 801 Wetmore Everett, Washington	Dec. 1962 20 students	Part of 2-year Computer Programmer course	Dec. 1962 25 students	
Clover Park Voc.-Tech. School 4500 Steilacoom Blvd. S. W. Lakewood Center 99, Wash.	Sept. 1962 20 students	Part of 2-year Computer Programmer course	Sept. 1962 50 students	1962 18 students
Lower Columbia College 1600 Maple Street Longview, Washington	Presently considering offering a day program			
Olympia Voc.-Tech. Institute 317 East Fourth Olympia, Washington	Sept. 1962 20 students	Part of 2-year Computer Programmer course		1960 60 students

School	Full Time Day 2-year Computer Programmer	Full Time Day 1-year Unit-Record Operator	Full Time Day Key-Punch Operator	Evening Extension Programs for Employed Workers
Columbia Basin College 2600 North Chase Pasco, Washington	Sept. 1962 20 students	Part of 2-year Computer Programmer course		1962 60 students
Renton Vocational School 1220 - 4th Ave. North Renton, Washington	Tentative plan for 1965			1960 880 students
Richland School District Administration Building 615 Snow Avenue Richland, Washington				1962 50 students
Edison Technical School 1625 Broadway Seattle, Washington	Sept. 1962 45 students	Sept. 1959 100 students	1959 250 students	1958 500 students
Highline School District 253 S. 152nd Street Seattle 88, Washington	Sept. 1963			
Shoreline Community College East 158th & 20th N. E. Seattle 55, Washington	Presently considering offering a day program			
Spokane Community College E. 3403 Mission Avenue Spokane 24, Washington	Dec. 1962 20 students	Part of 2-year Computer Programmer course		1962 27 students
Tacoma Voc.-Tech. Institute 1101 South Yakima Avenue Tacoma 5, Washington	Sept. 1962 24 students	Sept. 1961		1960 170 students
Clark College 1925 Fort Vancouver Way Vancouver, Washington	Dec. 1962 15 students	Part of 2-year Computer Programmer course		1962 30 students
Yakima Valley College So. 16th & West Lenox Yakima, Washington	Plan for Dec. 1963			
Total Enrollments for the 1962-63 school year	224	100	325	2,235

WASHINGTON STATE DATA PROCESSING
TECHNICIAN EMPLOYMENT NEEDS
March, 1963



It is estimated that, by 1970, an average of 500 Data Processing Technicians will be needed annually in the State of Washington. This statement is based upon three national need predictions from Department of Labor and articles in Business Week and Automation magazines.

Washington State government presently employs 65 programmers. Their present plans call for 30 new programmer employees in 1963 and 30 new programmer employees in 1964.

Throughout the State of Washington, industry and government presently employ 600 Data Processing Technicians.

Annual turnover rate for Data Processing Technicians is ----------20%
Average annual increase in Data Processing industry ----------15%
Total annual increase ----------35%

35% x 600 = 210 annual data processing technicians needed in the State of Washington.

AREA VI. THE STUDENT

Students entering the two-year Data Processing program should be high school graduates or the equivalent who have a demonstrated competence in high school mathematics. In addition, they should have shown an interest in mathematical analysis and physical sciences. The latter may actually be more meaningful than credit in advanced mathematics for the students' progress.

Experience with student success in this program indicates that those who pass the "Programmers' Aptitude Test" with a minimum score of 50 have a realistic opportunity for success in the program and on the job. This score should be used as a valid indicator of the applicant's chances for success, but other factors--such as personality, energies, goals and past achievement--which will affect the student's potential, should be considered.

The test to discover aptitudes should be followed by interviews to be sure the student understands thoroughly what is required. Past experience has indicated that there will be a high dropout in the program unless adequate counseling and guidance are given the student. Last year the average dropout in these programs was a little over forty per cent. A more realistic dropout would not exceed thirty per cent of the students in a two-year program.

A typical student's daily schedule would be three hours in the Data Processing laboratory and two hours in related training courses. Therefore, depending upon schedule, a student usually averages five hours per day in these classes for one or two years.

AREA VII. THE INSTRUCTOR

It is a well-established fact that the success of any curriculum is dependent upon a well-qualified instructional staff. In this program the educator must be viable--he must be creative and ready to meet fluid, flexible conditions.

The Data Processing instructor should have a minimum of three years of Data Processing experience beyond the learning period, having worked with a variety of equipment in varied situations in business or industry. He should have performed competently at the level of advanced programmer or systems analyst or supervisor of a Data Processing department using a computer system. He must have technical competence as well as business experience and professional education, with emphasis on experience in Data Processing.

In selecting instructors, school administrators can do one of two things. Some states, because of the scarcity of Data Processing instructors, have been forced to take a trained professional teacher, such as an instructor in business administration, and send him to Data Processing schools and on-the-job training.

Basically, in Washington State, our method was to use Data Processing programmers or systems analysts from industry who already knew the technology. They begin teaching after a summer of special teacher training workshops or in-service teacher training courses. In other words, we believe it is not only better, but easier, to teach methodology than technology.

The twenty-five full time Data Processing instructors in the State of Washington average ten years of Data Processing experience in industry, three years of college education and two years of teaching experience. Their average age is thirty-seven years.

AREA VIII SELECTION OF LABORATORY EQUIPMENT

Laboratory equipment must be installed which will provide the necessary envirnonment and practic situation that will allow the student to meet the objectives of the two-year curriculum. The equipment must be of sufficient capacity, speed and flexibility to handle common data processing applications of a normal manner for a large group of students. The machines should be representative of equipment which is in common use in commercial, scientific and governmental organizations.

The unit record machines should allow for normal application design and processing. The configuration of each machine should be such that the student will be learning in a realistic situation. Common features, which the graduate is likely to encounter, should be available for use in laboratory practice problems.

The computer system should be not only in common use, but also a current model which will be updated with technological improvements. The system should be supported by proven and accepted programming systems. The system should use common programming techniques, and be programmed with relative ease but have the capacity to process large and complex problems. It is highly desirable that the system have card input/output, not only because of its common use, but also because card input will allow minimum handling of data and programs, with ease of inserting corrections as the student learns. It is essential that the equipment manufacturer provide support through representatives with extensive background in data processing and in technical training programs. This support must include curriculum development and revision, installation planning and coordination, and assistance in implementing the program at each training center.

The reasons listed above were considerations which influenced the Washington State training centers, with the support of local advisory groups, to choose the equipment listed below for the data processing laboratories. All centers

have similar laboratory facilities, with minor variations of additional machines or features. Compatibility of laboratory facilities was encouraged through a well-coordinated statewide program, thereby providing interchange in instructional material among training centers.

In the final selection of equipment the cost must be realistic. The total cost to the centers, including the manufacturer's educational allowance, and availability of support through NDEA Title VIII matching funds, will be a critical factor.

INITIAL EQUIPMENT INSTALLATION

Machine	Model	Description
026	1	Printing card punch
056	1	Card Verifier
083	1	Card sorter with Auxiliary Counter and Sort Suppression
085	1	Collator
407	A1	Accounting Machine
548	1	Card Interpreter
519	1	Reproducer with Mark Sensing
		COMPUTER SYSTEM
		(May be installed at end of first term)
1620	1	Data Processing System with Indirect Addressing Automatic Divide
1622	1	Card Reader Punch
1311	3	Disk Storage Drive

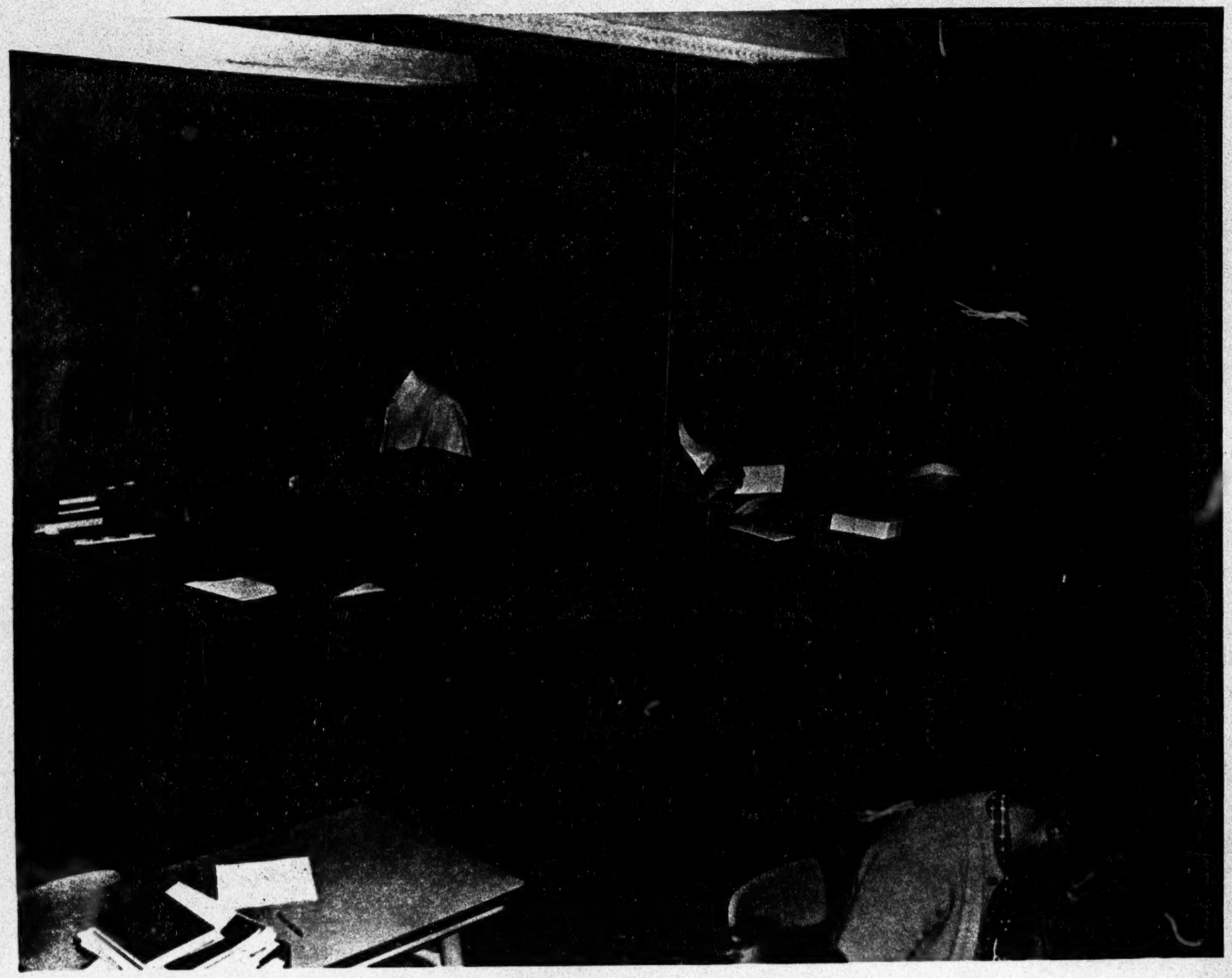
PICTURES AND DIAGRAM

OF TYPICAL DATA PROCESSING LABORATORY

Pictures on the following pages are from Olympia Vocational-Technical Institute's data processing laboratory which has operated satisfactorily and constitutes one of Washington's better laboratory arrangements.

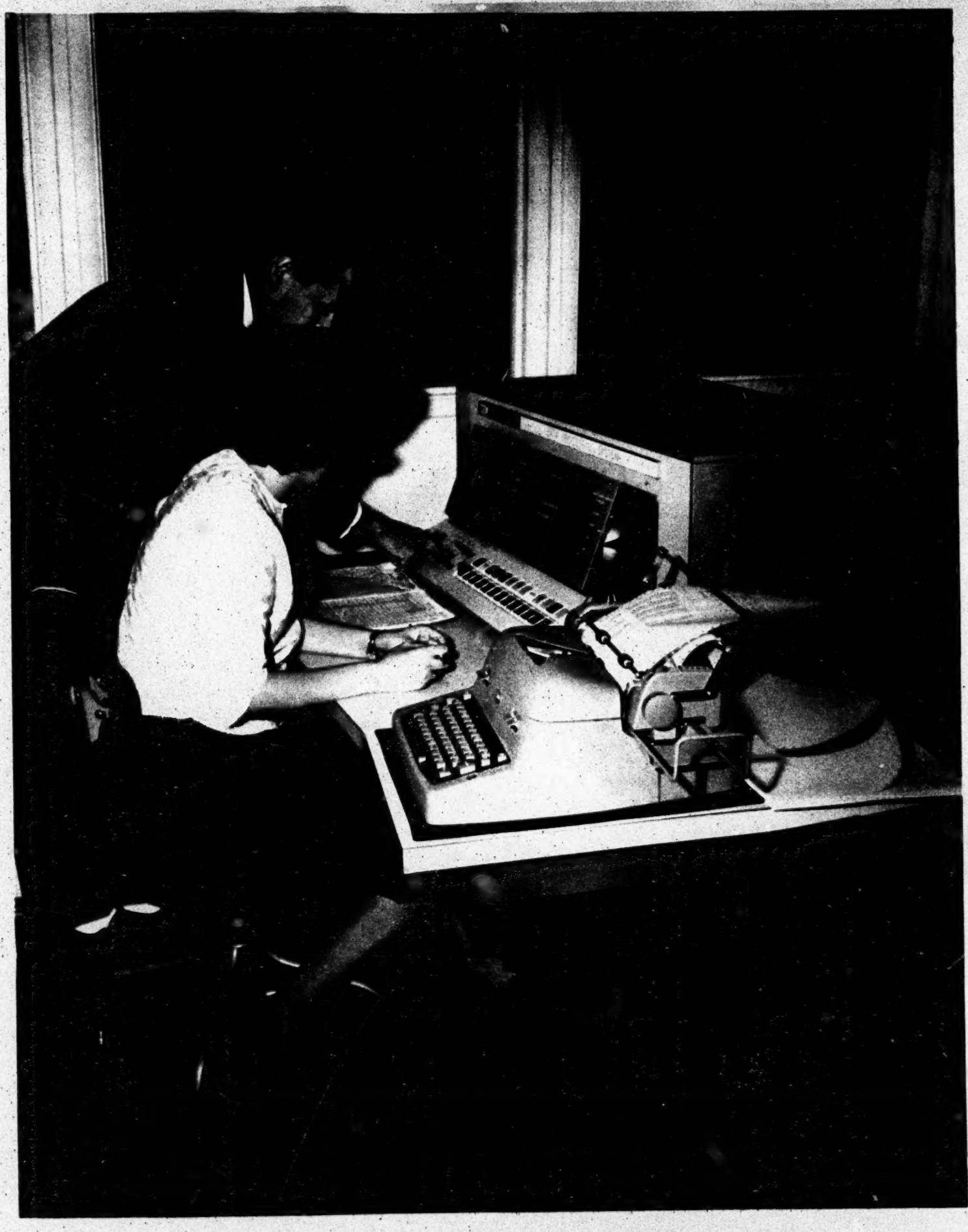
Part of the third floor of the Institute was remodeled to accommodate the installation of a data processing laboratory. Existing space was adequate to easily achieve ideal working arrangements.

Following the pictures is a floor plan of Olympia's three data processing rooms.

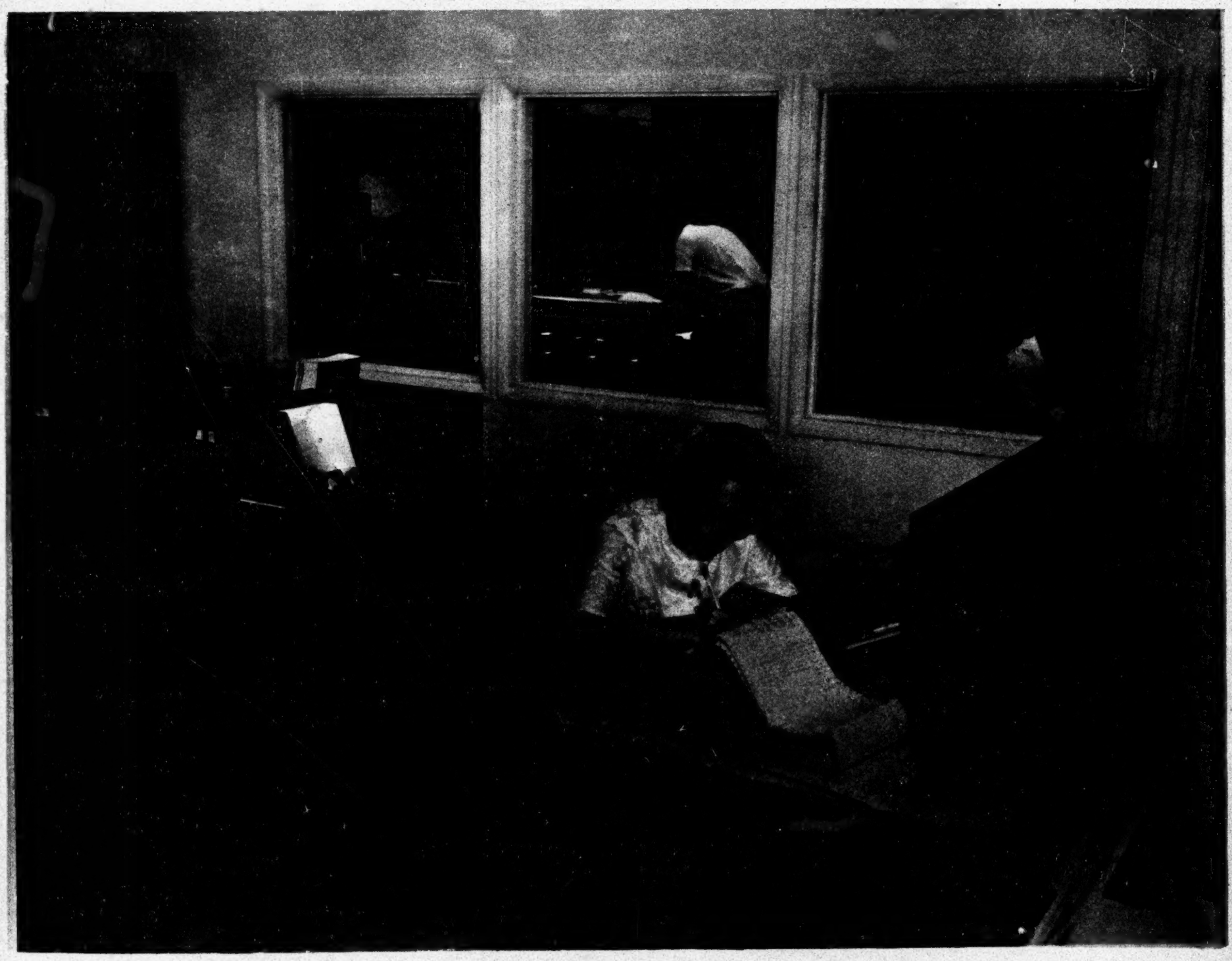


Arrangement of the unit record machine laboratory allows adequate work space and materials and equipment storage.

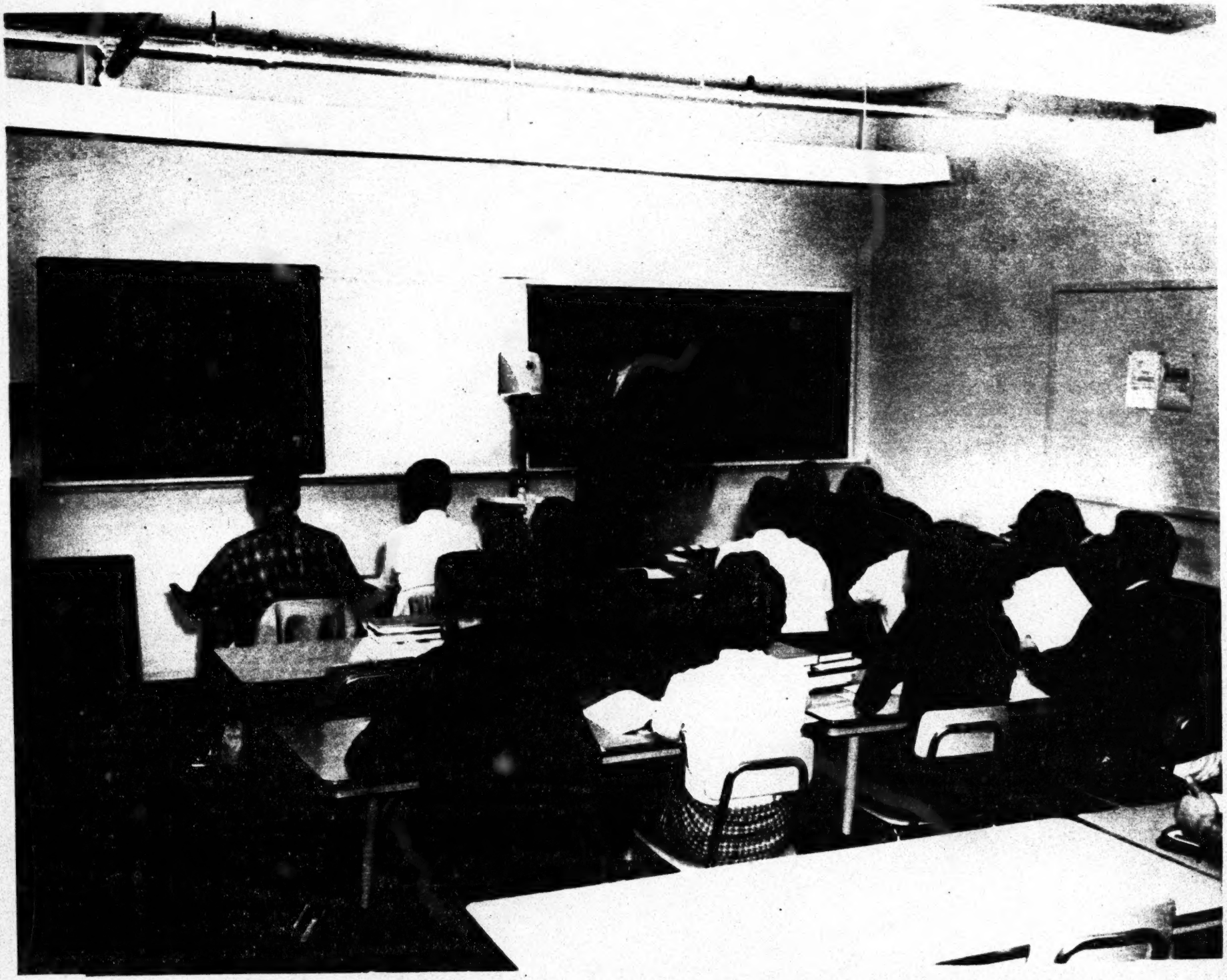
Looking from the unit record machine laboratory through the computer laboratory into the classroom through glass partitions allows the instructor to monitor activity in all three areas.



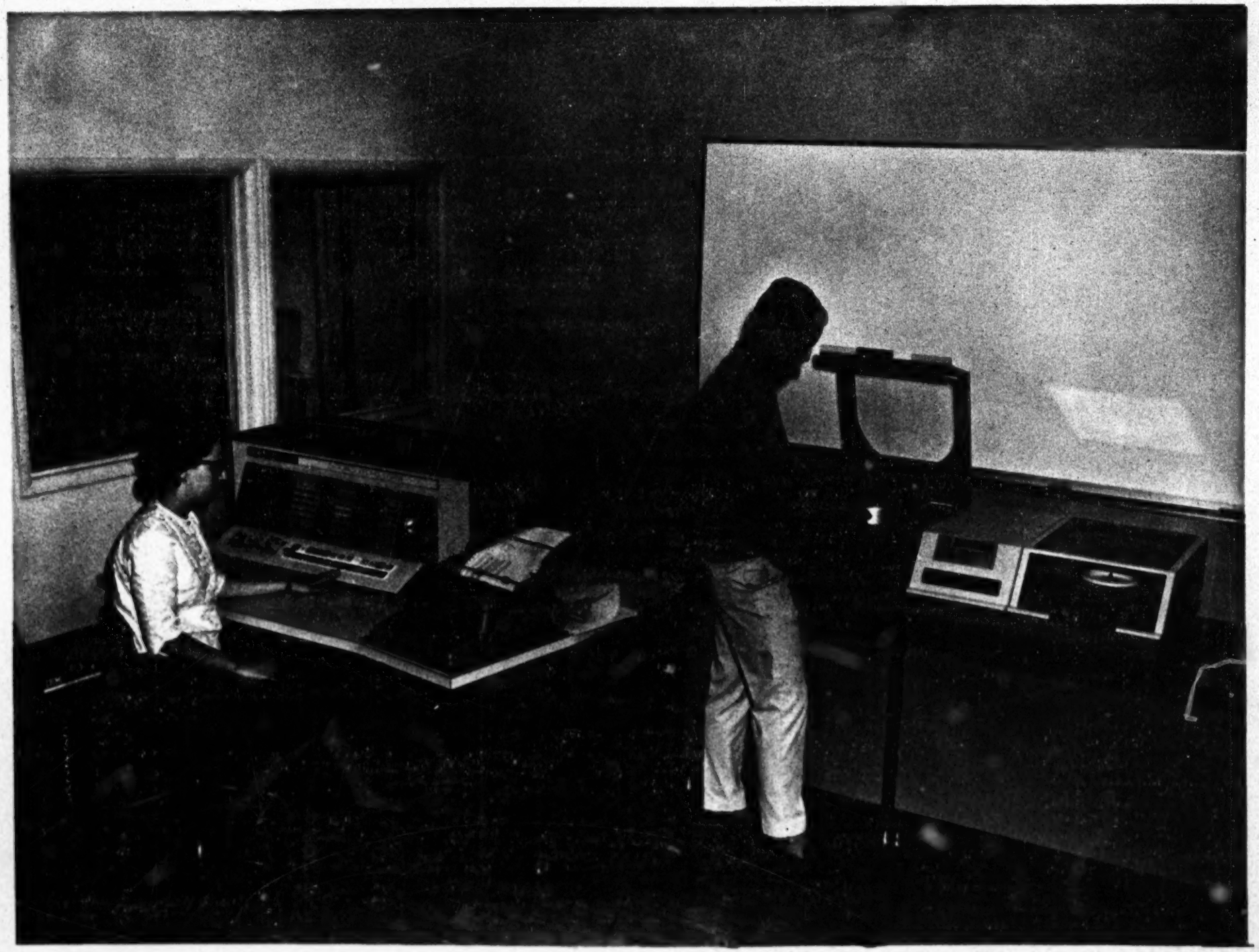
The laboratory computer allows actual instruction in both student written and demonstration programs. The instructor, Mr. Larry Shull, demonstrates computer console operation.



Student programmer checks operation of her program as it runs in the computer through the use of the console typewriter.



Classroom may be used as a lecture room, as is here illustrated. The 3-hour block time approach to training in the technology also will allow for use of the classroom for individual study or work projects.



Disk storage units, added to the computer, exemplify the expandability of the system through addition of input/output units. These units and others, such as an on-line printer, provide for teaching programming techniques adaptable to any data processing system.

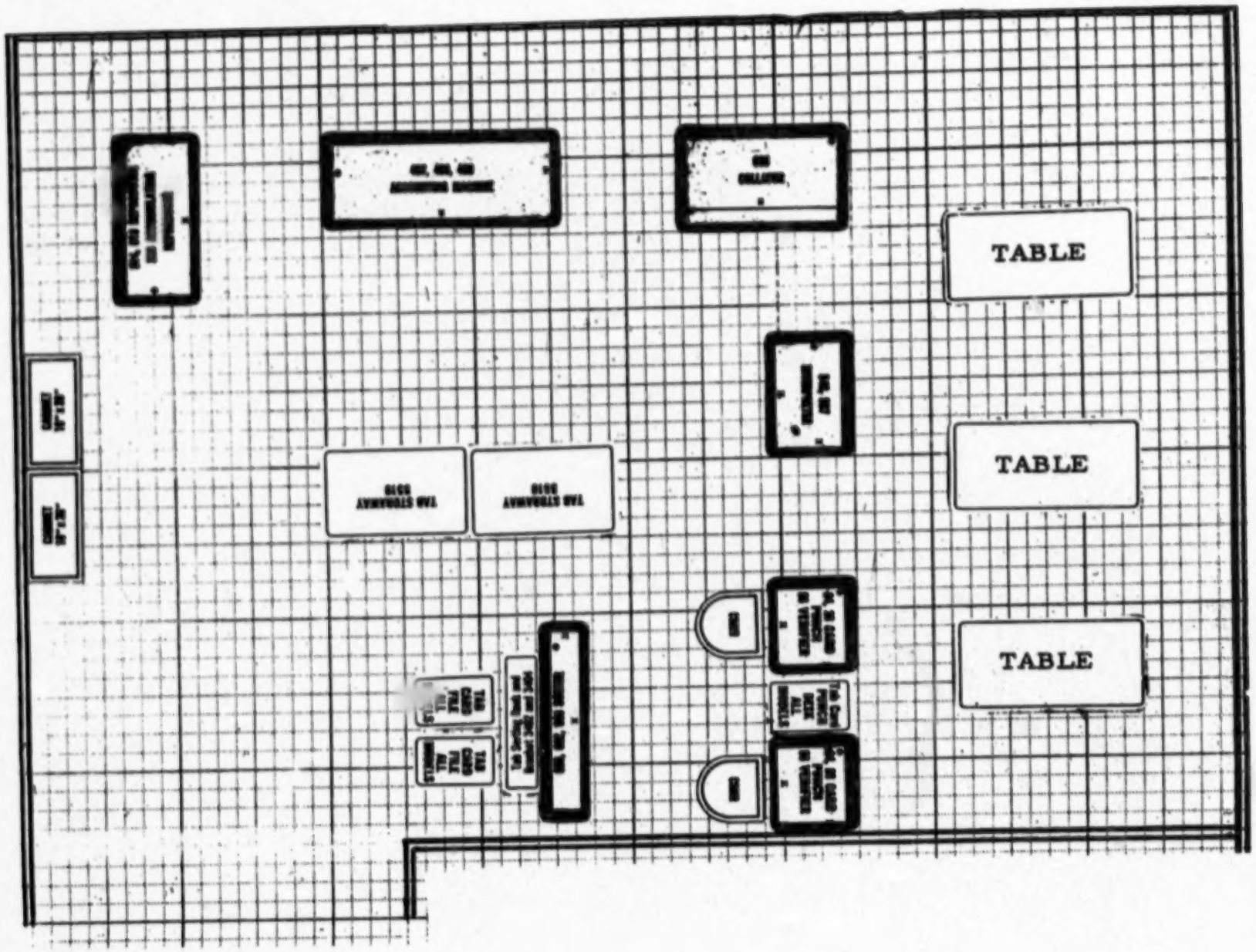


TABLE
TABLE
TABLE

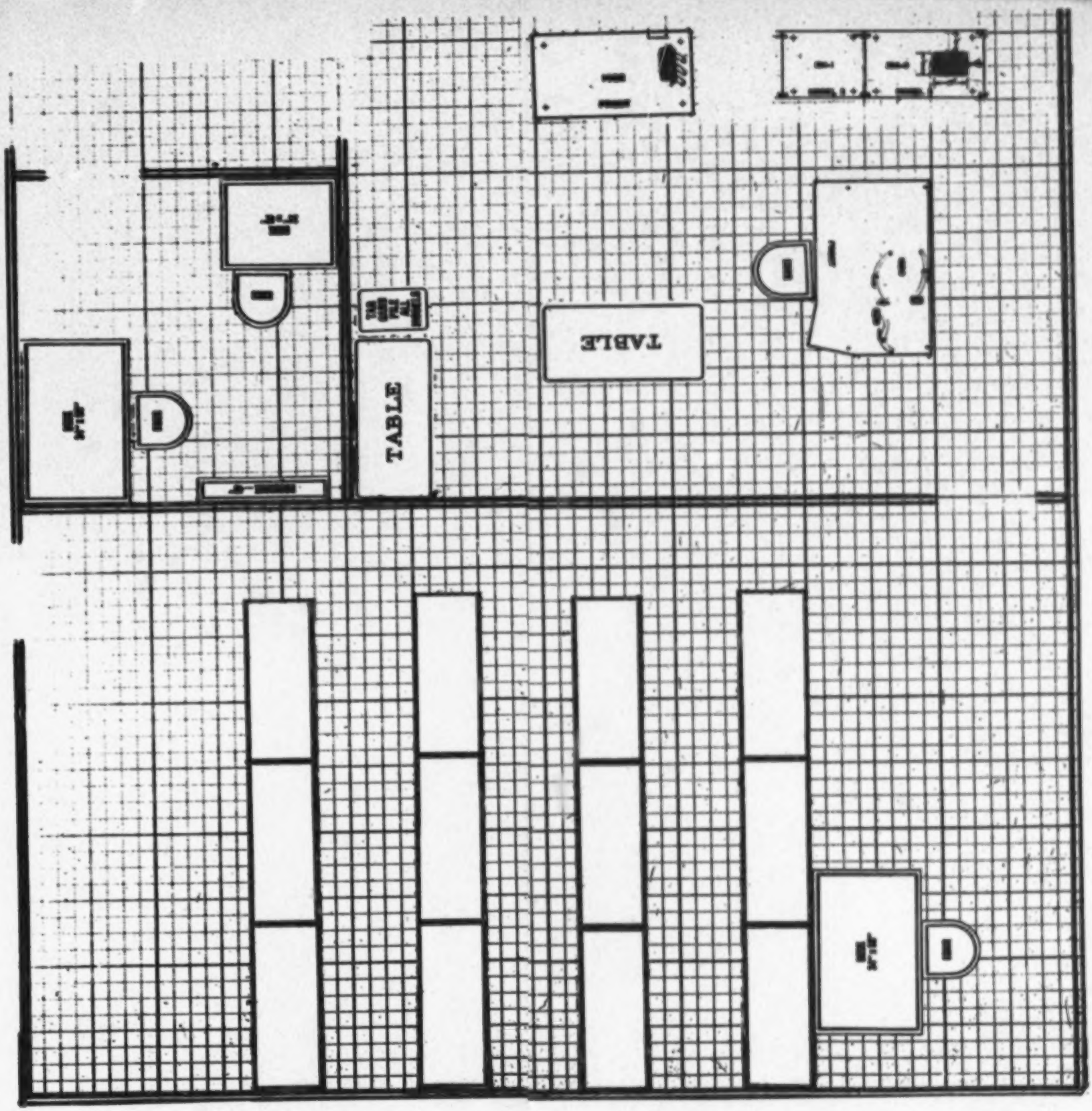


TABLE
TABLE

AREA IX. INSTALLATION AND OPERATIONAL COSTS OF A DATA PROCESSING PROGRAM

Installation Costs

There are two basic costs to be considered in the initial installation of a Data Processing training program. One is the initial cost of the equipment and facilities, the other, the continuing operational costs.

Most of the Data Processing training programs in the State of Washington are similar to each other. The following would be a typical approach to solving the financial problem. Regarding facilities, most schools remodeled classrooms or laboratories to create a Data Processing laboratory at costs varying from two to eight thousand dollars. They average 1,700 square feet and consist basically of two rooms--a classroom close to the main laboratory (often separated only by a glass partition), and a laboratory, usually consisting of two operations (sometimes separated by glass partitions also), one being the unit record room and the other the computer room. There is nothing special about these laboratories--they need no particular floor construction or extensive refrigeration equipment, but they do need good light and forced air circulation (air-conditioning will probably be needed in most areas of the U. S. for the laboratory facility).

The ten schools in operation and the five in development which qualified for the IBM educational allowance have IBM 1620 computer equipment with a Disc File Storage System. Three of these schools purchased their equipment at an approximate cost of $100,000, while the actual valuation would be more than $200,000. The other schools spent approximately $5,000 on accessory equipment and are renting the rest of the Data Processing lab equipment. This rent is included in the operational costs.

Operational Costs

The first year operational costs for a one-instructor laboratory accommodating twenty beginning students would approximate $38,500. Although with help in some of the related subject matter areas, this one instructor and one laboratory might accommodate two beginning groups of students with little additional cost. Most schools in Washington found it necessary for the instructor to devote approximately one-third of his time to set up the laboratory, develop the curriculum, and to get the program operating smoothly during the first year.

The following is a typical breakdown of costs in operating a one-instructor, one-laboratory with twenty beginning students:

Estimated Cost - First Year

I.	Instructor Salary	$ 8,500
II.	Equipment . . . . . (Approximately $15,000 of this is for rental of data processing equipment)	$ 23,000
III.	Supplies	$ 2,000
IV.	Overhead . . . . . (Heat, light, maintenance, administration. 20% of the budget)	$ 3,000
V.	Other . . . . . (Freight, installation, and miscellaneous costs)	$ 2,000
		$ 38,500

Second year: With very little additional equipment in the laboratory, it is possible after the program is organized and running smoothly, to operate three programs in the one laboratory, with auxiliary classrooms-the beginning students in the morning with one instructor, mainly unit-record; the second year students in the afternoon with a different teacher, mainly computer programming; and third, special courses offered sometimes in the day, but mainly

in the evening, with part-time teachers.

This would constitute about two and one-third teachers operating in the one laboratory accommodating 20 beginning students, 15 advanced students, and approximately 100 part-time students or an equivalent of 50 full-time students.

The following is the cost of this type of program as outlined above, operating during the second year:

Estimated Cost - Second Year

I.	Instructors' Salaries		$ 19,000
	1 teacher, first year, unit record	$7,500	
	1 teacher, second year, computer programmer . .	8,500	
	1 part-time teacher for evening and special classes	3,000	
II.	Equipment		$ 22,000
III.	Supplies		$ 3,000
IV.	Overhead . . . . . (Heat, light, maintenance, general administration, general campus, approximately 20% of the budget.)		$ 4,000
V.	Other . . . . . (Equipment replacement)		$ 2,000
	Total		$ 50,000

Summary

The first year of this program is extremely expensive, approximating $2,000 per full-time student, although this is necessary to assure the foundation and proper starting of a new and needed major technology. The second year, which would be typical of a normal operating yearly cost after the special starting problems are accomplished, is more realistic, averaging approximately $1,000 per full-time student.

Washington's method of financing, with its additional state and federal vocational monies to compensate for the additional cost of operating these types of courses, makes it possible to operate this and other technical programs as much in the black as any basic academic course.

AREA X REVIEW COMMITTEE FOR
STATE DATA PROCESSING CURRICULUM GUIDE

On July 17, 1963, a statewide Data Processing Curriculum Review Committee was established with representation from industry and some of the first year data processing instructors, for the purpose of reviewing and rewriting the second edition of the State's data processing curriculum guide. Appreciation is hereby expressed to the following individuals and companies for their time and real contributions; many of their ideas and concerns appear throughout this publication and in the State Data Processing Curriculum Guide:

John Bowe, Senior Supervisor
Business Training
Boeing Airplane Division

(Alternate) Jim Church
Data Processing Business Training
Boeing Airplane Division

Elton Chase
Data Processing Department Head
Clark College

Ben Ellis
Education Representative
International Business Machines,Inc.

Merle Gibson
Office Manager
Aluminum Company of America

Frank Haas
Account Representative
International Business Machines,Inc.

Lynn Huff
Director of Systems Development
General Insurance Company

Vince McDonald
Office Manager
Crown-Zellerbach

Miles Meadows
Senior Supervisor
Computer Training Unit
Boeing Aerospace Division

(Alternate) Bob Hanson
Supervisor, Computer Tr. Unit
Boeing Aerospace Division

Larry Shull
Data Processing Department Head
Olympia Vocational-Technical Inst.

Jewell Smith
Data Processing Department Head
Columbia Basin College

Bill Southworth
Consultant, Data Processing
Central Budget Agency
State of Washington

The review committee had two major general sessions of one day each and a number of sub-committee meetings. Following is a brief summary of the ideas and concerns expressed in fifty pages of committee notes developed in those meetings.

In general, the committee felt that the State curriculum guide as rewritten in the second edition, provides realistic guidelines and, in the main, they approved of the subject matter and courses contained in the curriculum guide. They expressed the belief that the programs were well equipped and in general adequately housed. They felt the program, in total, was needed and the goals are realistic; that it should provide well-trained data processing technicians in sufficient numbers to relieve the critical shortage of this type of personnel.

The concerns of the group fall basically into three major areas -- (1) How to obtain qualified instructors, (2) How to recruit qualified students, and (3) How to maintain high standards in the training program (quality versus quantity).

(1) School system salaries are below the minimum to attract and retain qualified EDP instructor personnel. The key issue in creating and sustaining the EDP education program is the availability of qualified personnel as instructors. Unless this issue can be satisfactorily resolved, the program is doomed to failure or at best will fall into disrepute. The basic economic law of supply and demand applies to educational institutions as well as the commercial world.

(2) In student selection there can be no real substitute for good, mature, judgment. This good judgment coupled with the following selection guides should produce a quality of student with better than average assurance of their success.

Past experience has proven that the programmer aptitude test is the most reliable selection aid. Therefore, it should be used in all instances. A student should achieve at least a 50 on the

program aptitude test. This score could be modified slightly when coupled with the instructor's judgment and a review of the student's high school records, a review of the work records, and interpretation of his references, should determine whether or not the student be admitted.

(3) There is indication that some of the problems are already in the process of being solved and certainly there is the grounded belief that the program will be successful. The group stressed a striving for quality, not quantity, and to make sure that the early graduates are the best that can be produced. Vigilance on the part of everyone in setting and maintaining the highest of standards is absolutely essential.

XI SUMMARY

Washington's Data Processing training programs are living examples that vocational educators can meet the challenges of our technological society.

Change is characteristic of our time; in this program it is ceaseless. The needs of industry are changing so rapidly that there is less and less lead time available to plan vocational education programs, and vocational educators must be ready to add or drop part of a training program quickly. "Overnight Blooming" of new technology will become the rule rather than the exception in the future. An example of this overnight blooming is evident in the State of Washington where there was no Data Processing training in 1960. Now, in 1963, more than 2,000 students are enrolled in the program.

Another example necessitating rapid updating in all vocational programs was emphasized in facts published by Aerospace industries and indicates a growing complexity in industry. It was pointed out that the cost per pound for Aerospace products had risen from $10 per pound during World War II to $100 per pound in 1959. By 1963 the price had risen to $1,000. Note the increase from $10 to $100 occurred during the first 15 years, while the accelerated increase from $100 to $1,000 occurred in the last five.

Vocational-technical education in Washington will continue to improve because vocational educators have realized the changes taking place and are meeting the problem by training technicians for present and future employment demands. Their special education programs for training the work force are keeping pace with the changes of our time.